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Taxonomic Studies in *Deutzia* Thunb. (Saxifragaceae s. l.) in Japan 3. Chromosome Numbers of *Deutzia bungoensis* Hatus. and *D. ogatae* Koidz.

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Somatic chromosome numbers of two Japanese species of *Deutzia* are reported. The chromosome number 2n = 78 was found in *D. bungoensis* Hatus. collected from Okayama Prefecture, W. Honshu; 2n = 130 was in *D. ogatae* Koidz. from Ehime Prefecture, Shikoku. The chromosome number of *D. ogatae* and 2n = 78 in *D. bungoensis* were reported for the first time.

Key words: Chromosome number, cytology, *Deutzia*, ploidy.

Deutzia, ranging from Himalaya to Japan and the Philippine Islands through China, Korea, and Taiwan, and also Mexico, consists of 55 species (Zaikonnikova 1966). Of these, twelve species and four varieties are distributed in Japan (Ohba and Niu 2001).

Cytological studies on Japanese *Deutzia* have been carried out by several workers including Funamoto and Nakamura (1992, 1994), and Niu and Ohba (2000, 2001). Previous studies have shown the chromosome numbers from eleven of the Japanese species, and one variety, to have chromosome numbers which fit within a ploidy series with the basic chromosome number, x = 13. The authors also reported the positive correlation between the pollen size and ploidy level (Niu and Ohba 2001).

The present study reports chromosome numbers and other noteworthy cytological features for *D. bungoensis* and *D. ogatae*.

Materials and Methods

Materials of *D. bungoensis* and *D. ogatae* were collected from calcareous sandstone habitats in Ehime Prefecture and Okayama Prefecture in 1998 and 2000 by the first author, and cultivated in a nursery of the University Museum, University of Tokyo, in Tokyo. Vouchers are deposited in the herbarium of the University of Tokyo (TI).

For observations of somatic chromosomes, young root tips were fixed in 45 % acetic acid at 0°C for 15 minutes after pretreatment with a 0.002 M 8-hydroxyquinoline solution at 20 °C for 4 hours. The materials were hydrolyzed in a 1 : 1 mixture of 45 % acetic acid and 1M HCl at 60 °C for 2 minutes and transferred to 2 % aceto-orcein for staining. Suitable cells were analyzed, drawn and photographed using a Nikon microscope (AFM-B). The taxonomic treatment essentially follows Ohba and Niu (2001).

Results and Discussions

The chromosome numbers of *Deutzia bungoensis* Hatus. and *D. ogatae* Koidz. are given in Table 1 with their collection data. The metaphase chromosomes of each species are shown in Fig. 1.

Deutzia bungoensis: This species is distin-

guished from the other species by the sessile leaves, the pyramidal-paniculate inflorescence with small flowers, and the indistinctly toothed filaments. It has been found in Kyushu (Kumamoto, Oita and Miyazaki Prefectures) and disjunctively in W. Honshu (Okayama Prefecture) (Ohba and Niu 2001). The chromosome counts for all the materials of this species in this study were 2n = 78 (Fig. 1–A). This finding differs from the 2n = 52 reported by Niu and Ohba (2000). The chromosomes are short and range in length from 2.1 μm to about 1.1 μm.

Hatusima (1954) supposed *D. bungoensis* to be a natural hybrid between *D. floribunda* and *D. scabra* var. *sieboldiana*. Both putative parents have not been found outside of Kyushu, and the 2n = 78 does not support a hybrid origin from parents with 2n = 78 (*D. floribunda*) and 26 (*D. scabra* var. *siebold-*

Table 1. Localities and chromosome numbers of two species of Japanese *Deutzia* investigated in this study

Taxon	Locality	Voucher	Chromosome number (2n)
D. bungoensis	Okyama Pref., Maniwa-gun, Ochiai-cho, Shiotaki, alt. 370 m	Y. Muneoka 1-1	78
	Okyama Pref., Maniwa-gun, Ochiai-cho, Shiotaki, alt. 370 m	Y. Muneoka 1-2	78
D. ogatae	Ehime Pref., Kitauwa-gun, Tsushima-cho, Nametoko, alt. 350 m	L. M. Niu 98646	130
	Ehime Pref., Kitauwa-gun, Tsushima-cho, Nametoko, alt. 350 m	L. M. Niu 98647	130

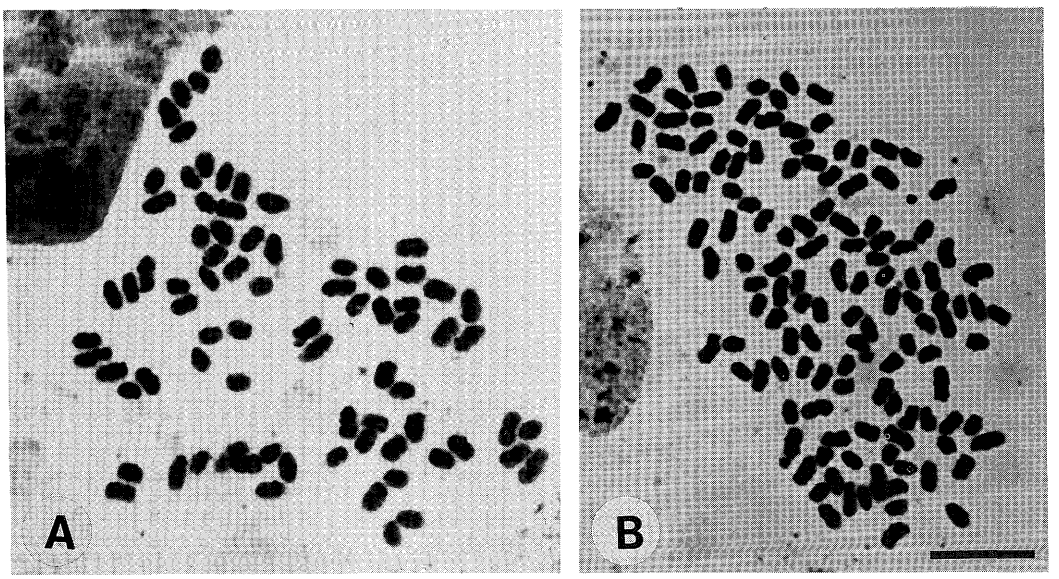

Fig. 1. Somatic metaphase chromosomes of *Deutzia*. A. *D. bungoensis*, 2n = 78. B. *D. ogatae*, 2n = 130. Bar = 5 μm.

iana).

The chromosome number 2n = 52 reported by Niu and Ohba (2000) was counted from materials collected in three different localities in Oita and Miyazaki prefectures. The length of the chromosomes for these specimens is between 1.9 μm and 0.9 μm. The specimens with 2n = 78 chromosomes which were collected from Okayama Prefecture (Fig. 2) are little different from the Kyushu

Fig. 2. *Deutzia bungoensis* Hatus. collected from Okayama Prefecture, Maniwa-gun, Ochiai-cho, Shiotaki (Y. Muneoka 1-1, June 4, 1998, TI). Inset: detail of inflorescence.

specimens (with 2n = 52 chromosomes) in gross morphology of both vegetative and reproductive features. Thus this finding suggests that *D. bungoensis* is a cytologically variable species with different chromosome numbers belonging to different ploidy levels.

The chromosome number 2n = 78 agrees with that of *D. floribunda* Nakai, which is distributed in the Sohayaki floristic region ranging from the Kii Peninsula (Honshu), through Shikoku to the Pacific Ocean side of Kyushu (Niu and Ohba 2000). Both species have a pyramidal-paniculate inflorescence with lower lateral branchlets much divided into small branchlets and small flowers plus the indistinctly toothed filaments, but *D. bungoensis* is distinguished from *D. floribunda* by the sessile, slightly amplexicaul leaves.

Deutzia ogatae: This species is only known from Ehime Prefecture, Shikoku, where it is scarce and is found in limestone ravines or mountain slopes. Both of our materials were collected in Nametoko, the type locality, Ehime Prefecture. The chromosome counts of this species were 2n = 130 (Fig. 1–B). The chromosome number of this species is reported for the first time. The chromosomes are short and range from 1.8 μm to 0.7 μm in length.

The shape and size of the pollen grains of *D. ogatae* were studied by Niu and Ohba (2001) under the name *D. gracilis* var. *ogatae*. Though the pollen grain of *D. ogatae* is the third largest among the Japanese *Deutzia*, it is suspected that *D. ogatae* might be hyperploid (Niu and Ohba 2001). The chromosome number, 2n = 130, agrees with that of *D. crenata* var. *crenata* (Niu and Ohba 2000). However, *D. ogatae* differs from *D. crenata* by the pyramidal-paniculate inflorescence and the thin leaves with light green surfaces.

This study reveals *D. bungoensis* has infraspecific variation of chromosome numbers, 2n = 52 (tetraploid) and 2n = 78 (hexaploid), in spite of gross-morphological uniformity in the specimens studied. This seems to be the second case of a species with variable ploidy levels in the Japanese *Deutzia*. In the case of *D. crenata*, two different chromosome numbers, 2n = 78, 130, were reported by Funamoto and Nakamura (1994), but the plants with the 2n = 78 are distinguished from var. *crenata* (2n = 130) as var. *heterotricha* with leaves pubescent on lower surfaces and stellate hairs with a central upright ray.

The cytological complexity in *D. gracilis* reported by Niu and Ohba (2000) depends on the taxonomic framework in which *D. hatusimae* and *D. zentaroana* are regarded as varieties of *D. gracilis*. The n = 65 reported by Sax (1931) in *D. scabra* is possibly erroneous because *D. scabra* is constant with 2n = 26 chromosomes (Funamoto and Nakamura 1992, Niu and Ohba 2000).

The karyotypes of the Japanese diploid and tetraploid species of *Deutzia* are similar in chromosome size and gradation of chromosome length (Funamoto and Nakamura 1992), but those of the hyperploids species have not been investigated in depth because the chromosomes are extremely small. Until now, all of the reported polyploid taxa of Japanese *Deutzia* are euploid with the basic chromosome number of x = 13, and we also did not find any aneuploids. The chromosomes of the polyploid species usually form only bivalents at meiosis due presumably to the low frequency of chiasma formation between homologous chromosomes (Sax 1931).

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鈕　力明，大場秀章：**日本産ウツギ属（ユキノシタ科）の系統分類学的研究 3. マルバコウツギとアオコウツギの染色体数**

これまで九州（熊本，宮崎，大分各県）に分布が限定されていたマルバコウツギ *Deutzia bungoensis* が，岡山県に産することが宗岡康成氏によって最近発見された．この岡山県産のマルバコウツギと愛媛県に特産するアオコウツギ *D. ogatae* について，体細胞の染色体を観察し，染色体数を調べた．

マルバコウツギは初島住彦により記載され，初島はこれをコウツギとツクシウツギの雑種と推定した．しかし，ツクシウツギは九州特産で岡山県には産しない．岡山県で発見されたマルバコウツギは形態上からは九州産のものと区別することはできなかったので，細胞遺伝学上の異同に興味があった．調べた結果，その染色体数は九州で採集した材料で算定した $2n = 52$ とは異なる $2n = 78$ であった．ウツギ属の染色体基本数 $x = 13$ と考えられるので，岡山産のものは6倍体，九州産は4倍体である．

ウツギ属における種内倍数性はこれまでウツギにのみ知られていたので，これはその2例目となる．なお，ウツギでは $2n = 78$ の個体は著しい有毛性を示すビロードウツギであり，$2n = 130$ は通常のウツギである．マルバコウツギの場合はすでに述べたように，2つの倍数性の間に形態上の差異を見出すことはできなかった．

アオコウツギの染色体数は $2n = 130$ であった．この種についてはこれまで染色体数の報告はなかったので，はじめての報告である．ウツギ属の染色体基本数は $x = 13$ と推定されるので，アオコウツギは10倍体であると考えられる．これは，日本産ではウツギとともにもっとも高次の倍数体種である．

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